

## ***Heptapterus mbya* (Siluriformes: Heptapteridae), a new species of catfish from the Paraná river basin, in Argentina**

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***Heptapterus mbya* (Siluriformes: Heptapteridae), a new species of catfish from the Paraná river basin, in Argentina.** - We describe a new species of heptapterid catfish of the genus *Heptapterus* from the streams Cuña-Pirú, Azul, and Moreno, in the province of Misiones, Argentina. *Heptapterus mbya* sp. n. is distinguished from all other congeners by dark plumbeous body and a low number of anal-fin rays that are branched (11-12) out of a total number of 15-17 anal fin rays, a large eye (13.8-17.9 % of HL), prepectoral distance 31.9-37.8 % of SL, distance between the last dorsal-fin ray and the adipose-fin origin 5.24-8.33 % of SL, adipose-fin base 47.4-58.5 % of SL, 13 principal caudal-fin rays, and 10-13 gill rakers on the first arch.

**Keywords:** new *Heptapterus* - Southernmost South America - Neotropical ichthyofauna

### INTRODUCTION

The genus *Heptapterus* is distributed throughout the rivers and streams of southernmost South America. The type species of the genus is *H. mustelinus* originally collected in the Río de la Plata, as cited by Valenciennes in 1835. In this paper we describe a new species, *Heptapterus mbya* sp. n., collected from the streams Azul, Moreno, and Cuña-Pirú in the Province of Misiones, Argentina. *Heptapterus mbya* sp. n. is a new endemic heptapterid catfish species to be added to the ichthyofauna of the Cuña-Pirú Valley. The Cuña-Pirú stream is located inside the Parque Provincial Salto Encantado and traverses the deep Cuña-Pirú Valley, eventually emptying into the Paraná. The Azul and Moreno streams are the very headwaters of Garuhapé stream, an affluent of the Paraná. The Parque Provincial Salto Encantado and the Cuña-Pirú Valley comprise 13.227 ha in the middle of Misiones and constitute a protected area where man-made transformations of the environment are minimal. Some endemic species from the area have been described, such as the characiforms *Astyanax tupi* Azpelicueta, Mirande, Almirón & Casciotta and *A. troya* Azpelicueta & Casciotta, Almirón and the freshwater catfish *Rhamdella cainguae* Bockmann & Miquelarena.

## MATERIAL AND METHODS

The measurements, following Aguilera *et al.* (2011), are straight-line distances made with a caliper down to nearest 0.1 mm. The vertebral count includes the elements of the Weberian complex and the compound preural+ural centra counted as one. The proportions are expressed as percentages of standard length (SL), head length (HL), or otherwise as indicated. Specimens were cleared and counterstained following Taylor and Van Dyke (1985). Multivariate analysis was performed with SPSS version 1997 in order to detect significant variables that can be used to distinguish *H. mbya* sp. n. from *H. mustelinus*.

Institutional acronyms follow Fricke & Eschmeyer (2010), with the exception of ZVC-P (Zoología de Vertebrados, Facultad de Ciencias, Montevideo).

**COMPARATIVE MATERIAL:** *Heptapterus mustelinus* (Valenciennes, 1835): MACN 359, 1 ex., 190.0 mm SL, Río de la Plata, in Olivos; MACN 2050, 1 ex., 120.0 mm SL, Río de la Plata, without precise locality; MACN 3370, 3 ex., 115.0-137.2 mm SL, Río de la Plata, in Vicente López; MACN 6187, 9 ex., 88.4-234.0 mm SL, Río de la Plata in Buenos Aires, Obras Sanitarias. All from Uruguay, Río de la Plata basin: ZVC-P 304, 3 ex., 146.0-169.0 mm SL, Departamento (Dep.) Canelones, río Mosquito; ZVC-P 3422, 10 ex., 68.1-144.8 mm SL, Dep. Florida, arroyo Milano, affluent of río Santa Lucía; ZVC-P 3874, 2 ex., 46.3-96.0 mm SL, Dep. Maldonado, arroyo Espinoso; ZVC-P 4147, 3 ex., 48.6-61.2 mm SL, Dep. Colonia, río San Juan; ZVC-P 5633, 4 ex., 116.2-128.6 mm SL, Dep. Montevideo, río Santa Lucía, cañada del Dragón in río de las Piedras. *Heptapterus qenqo*: All from Argentina, in Tucumán: AI 248, 1 ex. C&S, 121.8 mm SL, Dep. Juan Bautista Alberdi, río Chavarria; AI 252, 3 ex., 107.3-178.9 mm SL, Dep. Trancas, río Vípos, río Salí basin; CI-FML 3954, holotype, 183.5 mm SL, Dep. Trancas, río Rearte, río Salí basin; CI-FML 3955, 1 ex., 213.1 mm SL, Dep. Monteros, río Los Sosa, río Salí basin; CI-FML 3956, 1 ex. C&S, 168.9 mm SL, Dep. Burruyacu, río Medina, río Salí basin; CI-FML 3957, 1 ex. C&S, 121.8 mm SL, Dep. Juan Bautista Alberdi, río Chavarria; CI-FML 3958, 2 ex., 95.0-107.0 mm SL, Dep. Burruyacu, río Medina, río Salí basin; CI-FML 3959, 2 ex., 123.1-140.2 mm SL, Dep. Trancas, río Choromoro, río Salí basin; CI-FML 3960, 1 ex., 106.6 mm SL, Dep. Trancas, río Choromoro, río Salí basin; CI-FML 3961, 1 ex., 123.5 mm SL, Dep. Chicligasta, río Cochuna, río Salí basin; CI-FML 3962, 1 ex., 67.3 mm SL, Dep. Trancas, río Vípos, río Salí. *Heptapterus stewarti* Haseman, 1911: FMNH 54234, holotype, photographed by M. Littman. *Heptapterus sympterygium* Buckup, 1988: MZUSP 19179, holotype, photographed by E. Baena. Images have been examined from the All Catfish Species image base (Morris, Yager & Sabaj, 2010).

## RESULTS

### *Heptapterus mbya*, sp. n. Figs. 1-3, Tables 1, 2

**HOLOTYPE:** CI-FML 4008, 136.0 mm SL, Argentina, Misiones, río Paraná basin, arroyo Moreno at Ruta Provincial 202 (26° 54' 24" S-54° 54' 50" W) headwaters of arroyo Garuhapé, October 21, 2004, M. Azpelicueta, D. Aichino, D. Méndez (Fig. 1).

**PARATYPES:** All specimens come from Argentina, province of Misiones. AI 247, 4 ex. (1 C&S), 88.0-116.5 mm SL, arroyo Azul (200 m downstream from Puente Quemado, 27° 00' 46" S-54° 57' 06" W), October 21, 2004, M. Azpelicueta, D. Aichino, D. Méndez; AI 269, 2 ex.,

85.0-116.3 mm SL, arroyo Cuña-Pirú (26° 30' 20" S-54° 48' 03" W), March 10, 2005, M. Azpelicueta; CI-FML 4009, 2 ex., 136.6-165.8 mm SL, same collecting data; CI-FML 4010, 2 ex., 126.8-136.6 mm SL, arroyo Azul (27° 00' 46" S-54° 57' 06" W), October 21 2004, coll. M. Azpelicueta, D. Aichino, D. Méndez. MHNG 2722.092, 4 ex., 85-129.4 mm SL, same collecting data.

**DIAGNOSIS:** *Heptapterus mbya* sp. n. is distinguished from other species of the genus by the following combination of characters: adipose and caudal fins confluent, largest specimen less than 170 mm SL (maximum length 166.0 mm), dark plumbeous body, low number of anal-fin rays that are branched (11-12) out of a total number of 15-17 anal fin rays, a large eye 13.8-17.9 % of HL, prepectoral distance 31.9-37.8 % of SL, distance between last dorsal-fin ray and adipose-fin origin 5.24-8.33 % of SL, adipose-fin base 47.4-58.5 % of SL, 10-13 gill rakers on first branchial arch, 13 principal branched caudal rays, and 56-58 vertebrae. *Heptapterus qenqo* (Aguilera *et al.*, 2011) has the same number of anal-fin rays but it is distinguished by the presence of rudimentary serrae at base of the pectoral-fin spine (absent in *H. mbya* sp. n.).

**DESCRIPTION:** Morphometric data of the holotype and 14 paratypes are presented in Table 1. *Heptapterus mbya* sp. n. has a maximum of 166.0 mm SL (Figs. 1, 2). The body is covered by a deep layer of mucus; numerous sensory pits (pit organs) are distributed all over the body and fins. There are rare minute black soft structures, very fine, spiniform, embedded in soft tissues of the caudal fin, dorsal surface of pectoral and pelvic fins of females and males, independent of body size but with low number in young specimens. Spine-like structures form parallel rows, specially notably on caudal membrane (Fig. 3).

Dorsal profile of body nearly straight from snout tip to posterior region of head, scarcely convex from this point to dorsal-fin origin, straight from dorsal-fin origin to adipose-fin origin, then slightly tapering to end of caudal peduncle. Ventral profile slanting ventrally or straight from snout tip to pectoral-fin origin, straight or convex between pectoral and pelvic fins, straight between pelvic and anal fins, and scarcely slanting dorsally to end of caudal peduncle. Maximum body width at level of pectoral fins; posterior half of body increasingly laterally compressed to caudal peduncle. Maximum body depth at dorsal-fin origin, contained 8.2-10.2 times in SL.

Head relatively small contained 4.9-6.2 times in SL; head dorsoventrally depressed (depth of head between eyes 2.3-2.9 times into HL; depth of head at supra-occipital 1.8-2.2 into HL). Head covered by thick skin and a layer of mucus, head surface smooth with many sensory pits. Snout of moderate length (contained 2.6-3.0 in HL), rounded in dorsal view. Upper jaw scarcely projecting (projection 4.3-8.2 % of HL); premaxillary teeth covered by lower jaw when mouth closed. Anterior nostril with a very well developed tubular rim. Posterior nostrils preceded by large semi-circular membrane. Distance between posterior nostrils and eye shorter than internarial distance. Eye placed dorsally, covered by skin, small (its length 5.5-7.2 times in HL); interorbital relatively wide and straight, containing eye diameter 0.6-1.3 times (13.4-18.1 % of HL). Width of head at eye level 1.3-1.6 times into HL (71.8-78.7 % of HL). Mouth subterminal, opening anteriorly, wide; lips thin. Premaxilla with slightly rounded posterolateral corners; its anteroposterior length 3.6-4.2 times in premaxillary width (6 specimens measured). All teeth conical and fine, placed in 8-10 irregular rows in premaxilla, larger specimens with more rows; 6-8 tooth rows on dentary at



FIG. 1

*Heptapterus mbya* sp. n., holotype, CI-FML 4008, 136.0 mm SL, lateral view.



FIG. 2

*Heptapterus mbya* sp. n., holotype, CI-FML 4008, 136.0 mm SL, dorsal view.



FIG. 3

*Heptapterus mbya* sp. n. Spiniform structures embedded on most superficial mucous layer of the caudal fin. CI-FML 4008, detail of the holotype, 136.0 mm SL. Bar= 1 mm.

TABLE 1. Measurement data for *Heptapterus mbya* sp. n. expressed in percentages of the standard dimensions given above measurements. SL in mm.

|   | Holotype | Mean | Min  | Max   |
|---|----------|------|------|-------|
| <b>Standard Length</b>                    | 136.0    |      | 85.0 | 165.8 |
| <b>Percent of SL</b>                      |          |      |      |       |
| Predorsal-fin length                      | 34.7     | 34.5 | 30.6 | 37.1  |
| Preadipose-fin length                     | 50.8     | 50.2 | 43.4 | 54.8  |
| Prepectoral-fin length                    | 17.6     | 17.2 | 15.0 | 18.9  |
| Prepelvic-fin length                      | 35.7     | 35.1 | 31.9 | 37.8  |
| Preanal-fin length                        | 58.8     | 60.2 | 55.2 | 64.9  |
| Body depth at dorsal-fin origin           | 12.9     | 11.9 | 8.8  | 13.9  |
| Caudal peduncle depth                     | 6.3      | 6.4  | 5.8  | 7.2   |
| Caudal peduncle length                    | 20.9     | 20.6 | 17.9 | 24.2  |
| Head length                               | 19.1     | 18.8 | 16.1 | 20.4  |
| Body width                                | 13.8     | 13.9 | 11.8 | 15.4  |
| Second dorsal ray                         | 7.3      | 7.8  | 5.9  | 9.4   |
| Second dorsal-fin ray                     | 9.6      | 9.9  | 7.6  | 12.1  |
| Dorsal-fin base                           | 10.0     | 9.4  | 8.5  | 10.0  |
| Last dorsal-fin ray to adipose-fin origin | 6.9      | 6.9  | 5.2  | 8.3   |
| Adipose-fin length                        | 50.5     | 51.3 | 47.4 | 58.5  |
| Adipose-fin depth                         | 3.6      | 3.4  | 2.9  | 4.6   |
| First pectoral-fin ray                    | 10.2     | 10.6 | 9.0  | 11.8  |
| Second pelvic-fin ray                     | 11.4     | 11.0 | 9.4  | 12.7  |
| Anal-fin base                             | 19.8     | 18.8 | 14.5 | 21.6  |
| Anal-fin height                           | 3.0      | 4.5  | 3.0  | 6.0   |
| Dorsal-fin origin to caudal-fin base      | 67.6     | 66.9 | 64.3 | 70.9  |
| Pelvic-fin origin to caudal-fin base      | 62.7     | 65.1 | 62.7 | 67.2  |
| Anal-fin origin to caudal-fin base        | 39.1     | 39.3 | 36.2 | 42.1  |
| Pectoral-fin to pelvic-fin origins        | 20.5     | 19.9 | 17.8 | 21.8  |
| Pelvic-fin to anal-fin origins            | 25.0     | 26.3 | 24.8 | 28.7  |
| <b>Percent of head length</b>             |          |      |      |       |
| Snout length                              | 32.6     | 35.2 | 32.6 | 37.6  |
| Horizontal eye diameter                   | 16.5     | 15.4 | 13.8 | 17.9  |
| Eye to posterior margin of head           | 52.6     | 51.0 | 48.6 | 52.8  |
| Bony interorbital                         | 15.3     | 15.4 | 13.3 | 18.0  |
| Head depth at occiput                     | 53.0     | 49.2 | 45.4 | 53.8  |
| Head width                                | 74.2     | 74.9 | 71.8 | 78.7  |
| Gape width                                | 43.8     | 43.7 | 40.0 | 47.5  |
| Anterior tip to anterior nostril          | 11.5     | 12.5 | 10.4 | 14.1  |
| Distance between nares                    | 12.6     | 11.6 | 9.5  | 13.3  |
| Posterior naris to anterior eye margin    | 11.9     | 10.5 | 8.2  | 12.2  |
| <b>Percent of peduncle length</b>         |          |      |      |       |
| Caudal peduncle depth                     | 30.5     | 31.5 | 26.6 | 37.4  |

symphysis and fewer posteriorly. Origin of maxillary barbel close to anterior nostril, above rictus; basal third of maxillary barbel resting in a deep sulcus. Maxillary barbel usually reaching a vertical through mid of pectoral fin and scarcely surpassing pectoral-fin origin in few specimens. Tip of outer mental barbel usually reaching pectoral-fin origin, scarcely reaching branchiostegal membrane in two specimens. Tip of inner mental barbel scarcely reaching branchiostegal membrane.

Dorsal fin with one soft segmented ray and six branched rays; first dorsal-fin ray small, about two thirds of first branched ray. Second branched dorsal-fin ray

longest, about twice of last branched ray. Dorsal-fin origin anterior to a vertical through pelvic-fin insertion; in small specimens, dorsal-fin origin located scarcely anterior or at same level of pelvic-fin origin. Last adpressed dorsal-fin ray close to adipose-fin origin, increasingly so in smaller specimens. Adipose-fin origin located at a vertical through tip of pelvic fins or little posterior. Adipose fin long, confluent with caudal fin; adipose fin low, 12-18 times in its base.

Caudal fin rounded, its upper lobe longer and broader than lower lobe. Principal caudal-fin rays 1+(6-7)+1. Dorsal procurent caudal-fin rays 12-14, ventral procurent caudal-fin rays 17-21 (counted in 6 specimens). Anal fin short, low, its origin at a vertical through anterior fourth of adipose fin; in small specimens, anal-fin origin placed at anterior third of adipose fin. Distal margin of anal fin straight or slightly convex. Tips of last anal-fin rays close to or surpassing origin of caudal fin. Anal-fin with 15-17 rays (iii-v, 11-13; 2 with 11 branched rays; 9 including holotype with 12; 4 with 13). Pectoral fin i,6-8 (1 with 6 branched rays; 10 with 7 including holotype; 4 with 8); first pectoral-fin ray soft and segmented. Distal margin of pectoral fin rounded. First ray short, 1.2-1.7 times in fin length; third ray longest. Tip of pectoral fin reaching half length between pectoral and pelvic fin origins. A large axillary gland pore, above pectoral-fin insertion, close to posterior angle of opercle. Pelvic fin with i,6 rays; second branched ray longest; its distal margin rounded. Tip of pelvic fin reaching one third of distance between pelvic and anal fin origins. Inner pelvic-fin ray surpassing anus and urogenital papillae.

Urogenital papillae located immediately behind anus, somewhat tubular in males. Gonads of males with broad, finger-like projections.

Lateral line complete, ending on caudal peduncle; anterior lateral line ossicles without small plate-like expansions. Pores of cephalic sensory canals distributed as follows: supraorbital branch with four pores, infraorbital branch with six pores, mandibular branch with five pores, preopercular branch with six pores, and pterotic branch with 3 pores.

Swim bladder small, bilobed in shape (as an eight) transversely placed. Gill rakers somewhat short, slightly laterally compressed. Ten to thirteen gill rakers on first arch, distributed as follows: 0-3 on epibranchial, 1 on cartilage between epibranchial and ceratobranchial, 8-9 on ceratobranchial.

In two specimens, total number of vertebrae 56-58 (29-31 precaudal, 27 caudal); 9-10 pairs of ribs.

**COLOR UPON CAPTURE:** Background dark gray, whitish only on vent; a very slender lateral stripe from opercle to end of caudal peduncle. All unpaired fins dark gray with a notably darker margin on anal fin; pectoral and pelvic fins yellowish. Transverse dorsal bands barely visible.

**COLOR IN ALCOHOL:** Dark gray on dorsum, gray on sides of body and very light gray on ventral surface; head dark gray. Four transverse bands almost black, first one over supraoccipital region, second one at level of pectoral fins; third one at dorsal-fin origin, many times continued with an oval spot around dorsal-fin base; fourth band at adipose-fin origin. A very slender stripe developed from a dark area posterior to opercle to end of caudal peduncle. A light area on cheek. All fins dark gray, especially



FIG. 4

Type locality, arroyo Moreno at Ruta Provincial 202, province of Misiones, Argentina (26° 54' 24"S-54° 54' 50" W).

caudal fin. Dorsal fin with a light stripe near its base; anal fin with a dark band along its margin. Minute black rounded chromatophores scattered all over body, at different depths of skin. Large black, deep and star-like chromatophores spread on body. Chromatophores on myosepta, making myomeres very evident.

**ETYMOLOGY:** The Guaraní word *mbya* is the name of the aborigines that live in the Cuña-Pirú Valley and the Parque Provincial Salto Encantado. The name is applied as a noun in apposition.

**DISTRIBUTION AND HABITAT:** *Heptapterus mbya* sp. n. is found in the Cuña-Pirú, Moreno (Fig. 4), and Azul streams. The three streams are located in the río Paraná basin in Misiones, Argentina; the latter two, though, are headwaters of the Garuhapé stream. The largest number of specimens were collected in a pond about 1 m deep, with a slow current, and a sandy bottom; the place was bordered by dense vegetation, completely covered by shadow. The parameters measured were temperature at 18-20 °C, conductivity= 81 $\mu$ S/cm, and pH= 6.3.

## DISCUSSION

*Heptapterus mustelinus*, the type species of the genus, is the only member of *Heptapterus* recorded from the basins of Argentina, southernmost Brazil and Uruguay (Buckup, 1988; Bockmann & Guazelli, 2003). The type locality is the Río de la Plata

TABLE 2. Discriminant ratios, using eight measurements, for differentiation of *Heptapterus mbya* sp. n. and *H. mustelinus*.

|  | <i>H. mbya</i> |           | <i>H. mustelinus</i> |           |
|--|----------------|-----------|----------------------|-----------|
|  | mean           | min-max   | mean                 | min-max   |
| anal-fin base/dorsal-adipose length        | 0.37           | 0.31-0.47 | 0.16                 | 0.13-0.22 |
| pelvic-fin length/interorbital width       | 0.27           | 0.22-0.34 | 0.44                 | 0.34-0.67 |
| pelvic-anal fin origins/internarial length | 0.21           | 0.18-0.25 | 0.60                 | 0.36-0.92 |
| pelvic-anal fin origins/interorbital width | 0.11           | 0.09-0.13 | 0.18                 | 0.14-0.21 |
| anal-fin base/pelvic-fin length            | 0.60           | 0.50-1.04 | 0.38                 | 0.28-0.43 |
| anal-fin base/pelvic-anal fin origins      | 0.71           | 0.43-0.86 | 1.09                 | 0.92-1.43 |
| anal-fin base/internarial length           | 0.12           | 0.09-0.19 | 0.08                 | 0.07-0.09 |
| anal-fin base/posterior nostril-eye        | 0.11           | 0.08-0.15 | 0.07                 | 0.06-0.08 |
| interorbital width/interdorsal length      | 0.43           | 0.34-0.57 | 1.04                 | 0.69-1.43 |
| interorbital width/internarial length      | 0.76           | 0.64-0.93 | 0.49                 | 0.43-0.55 |

where the species is still common, especially in areas with lime. *Heptapterus mustelinus* is distinguished from *H. mbya* sp. n. by a higher number of anal-fin rays (18-22 vs. 15-17), a longer anal-fin base (20.9-28.0 % of SL vs. 14.2-21.6), shorter distance between pelvic and anal-fin origins (20.4-24.0 % of SL vs. 24.8-28.7), shorter distance between last dorsal-fin ray insertion and adipose-fin origin (3.1-4.9 % of SL vs. 5.2-8.3), and wider interorbital (18.9-24.9 % of HL vs. 13.3-18.0). Moreover, multivariate analysis detected ten additional ratios of sufficient differences to enable a discrimination of *H. mbya* sp. n. from *H. mustelinus* (Table 2).

At present, a new species of *Heptapterus* has recently been published (Aguilera *et al.*, 2011); the specimens of this new species have been collected in northwestern Argentina, in the Salí river basin. *Heptapterus qenqo* is distinguished from *H. mbya* sp. n. by the presence of rudimentary serrae on first pectoral-fin ray of adults, smaller eye (7.4-14.2 % of HL vs. 13.8-17.9), larger postorbital length (52.5-56.0 % of HL vs. 48.6-52.8), wider interorbital (17.6-24.1 % of HL vs. 13.3-18.0), and a maxillary barbel not reaching the first pectoral-fin ray in adults vs. one reaching half pectoral length in *H. mbya* sp. n.

The number of anal-fin rays distinguishes *Heptapterus mbya* sp. n. (15-17) from *H. bleekeri* (20-22), *H. fissipinnis* (23), *H. multiradiatus* (36), *H. ornaticeps* (19), *H. stewarti* (30), and *H. sympterygium* (22-29). Additionally, *Heptapterus mbya* sp. n. is distinguished from *H. bleekeri* by greater eye diameter (2.1-2.7 vs. 3.5 times in snout length), narrower interorbital distance (5.5-7.5 vs. 5 times in HL), and longer predorsal distance (2.7-3.3 vs. 2.6 times in SL); from *H. multiradiatus* by a shorter dorsal-fin base (1.8-2.2 vs. 1.5 times in HL); from *H. fissipinnis* by a smaller eye diameter (5.6-7.2 vs. 5.5 times in HL); and from *H. sympterygium* by the presence of anal and caudal fins separated. The adipose and the caudal fins confluent differentiates *H. mbya* sp. n. from *H. tapanahoniensis*, it with the adipose and caudal fins separated.

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